REMARKS

Claims 1, 3, and 6-7 stand rejected under 35 U.S.C. 103(a) as being obvious over Ando et al. (IEEE Trans. Mag., 33(5), 1997, 2983-2985). Applicants respectfully traverse the rejection because Ando et al. describe a soft magnetic layer between the pinned and perpendicular layers, whereas the present invention calls for a recording layer formed of an in-plane magnetic film that is formed on a substrate and a perpendicular magnetic film that is directly deposited on the in-plane magnetic film, as now recited in amended claims 1 and 7.

The Examiner considers the pinning layer shown in Fig. 1 of the Ando et al. reference to be equivalent to the in-plane magnetic film of the present invention. The perpendicular layer also shown in Fig. 1 of the Ando et al. reference is considered by the Examiner to be equivalent to the perpendicular magnetic film of the present invention. However, the pinning layer of the Ando et al. reference is used because the medium functions with a soft magnetic layer which is provided between the other two layers.

In contrast, the present invention provides that the in-plane magnetic film is formed on the perpendicular magnetic film, without sandwiching a soft magnetic layer. If the Ando et al. recording medium were modified by eliminating the soft magnetic layer, the recording media could not work. For this reason, this would not have been an obvious modification. Claims 1 and 7 are amended to clarify this feature of the present invention.

Additionally, since the pinning layer of the Ando et al. reference pins the magnetic domain of the soft magnetic underlayer provided thereon, it is believed by Applicants that the pinning layer and the perpendicular layer (*i.e.*, the perpendicular magnetic film) do not have related values of tBr, thickness, or Hc. Rather, the values of tBr, thickness, and Hc of the pinning layer are determined with respect to the soft magnetic underlayer provided thereon. Since there is no soft magnetic layer in the present invention, one would not be motivated to optimize the tBr product relationship of the perpendicular magnetic film, as recited in the present invention, so that it does not exceed one-fifth of the tBr of an in-plane magnetic film at the maximum.

Furthermore, the dependency of the perpendicular layer on the thickness as shown in Fig. 4 of the Ando et al. reference is a phenomenon observed only in perpendicular recording media having a two-layer structure without a pinning layer. Therefore, Applicants believe that Fig. 4 of the Ando et al. reference does not disclose or suggest a relation between the thickness and the pinning layer.

For these reasons, withdrawal to the rejection to claims 1 and 7 is respectfully requested. Claims 3 and 6 are dependent from claim 1, and are considered allowable for the reasons stated with respect to the rejection of claim 1.

Claims 1-3 and 6-7 stand rejected under 35 U.S.C. 103(a) as being obvious over Futamoto et al. (U.S. Patent Application Publication No. 2003/0022025 A1). In response, Applicants respectfully traverse the rejection.

The Examiner considers the soft magnetic layer/film 72 shown in Fig. 8 of the Futamoto et al. reference to be equivalent to the in-plane magnetic film of the present invention, and the perpendicular magnetization film 71 to be equivalent to the perpendicular magnetic film.

However, the Futamoto et al. reference is characterized in that the soft magnetic layer/film 72 (*i.e.*, the in-plane magnetic film) is never positioned under the perpendicular magnetization film 71 (*i.e.*, the perpendicular magnetic film). In addition, the in-plane magnetic film is a soft magnetic layer, and recording is executed on the perpendicular magnetization film 71. Thus, Applicants believe that the Futamoto et al. reference and the present invention are fundamentally different.

Moreover, the Futamoto et al. reference functions to stabilize a magnetization of the recording layer 71. In this manner, a structure is disclosed wherein the soft magnetic layer 72 is interposed under a hard protection layer 15.

In contrast, the present invention has a perpendicularly oriented thin film (*i.e.*, a perpendicular magnetic film) that is interposed on an in-plane oriented hard magnetic recording layer (*i.e.*, an in-plane magnetic film). Thus, the present invention does not have a structure with a soft magnetic layer, as in the Futamoto et al. reference, but a semi-hard or hard film which maintains the perpendicular orientation of the perpendicular magnetic film that is provided on the recording layer (*i.e.*, the in-plane magnetic film). Therefore, the present invention is considered different from the media of the Futamoto et al. reference.

As previously stated, in the Futamoto et al. reference, the soft magnetic layer/film 72 is positioned on the perpendicular magnetization film 71, whereas in the present invention the in-plane magnetic film is positioned under the perpendicular magnetic film. Accordingly, in the Futamoto et al. reference the soft magnetic layer/film 72 is thinner than the perpendicular magnetization film 71, whereas in the present invention the in-plane magnetic film is thicker than the perpendicular magnetic film. Because of these structural differences in position and thickness, Applicants believe that the Futamoto et al. reference does not disclose or suggest that an anisotropic magnetic field Hk of the perpendicular magnetization film 71 is at least 1.2 times as large as an anisotropic magnetic field Hk of the soft magnetic layer/film 72. Since the Fujimoto et al. reference does not disclose or suggest the recording layer formed of an in-plane magnetic film as formed on a substrate and a perpendicular magnetic film as directly deposited on the in-plane magnetic film, as now recited in amended independent claims 1 and 7, withdrawal of the rejection of claims 1-3 and 6-7 is respectfully requested.

Claims 1 and 3-7 stand rejected under 35 U.S.C. 103(a) as being obvious over Kawato et al. (U.S. Patent Application Publication No. 2002/0028356 A1). Applicants respectfully traverse the rejection.

The Examiner considers magnetic under layer 76/80 and Co-based amorphous ferromagnetic layer 105 of the Kawato et al. reference to be equivalent to the in-plane

magnetic film of the present invention, and the perpendicular magnetic layer 107 to be equivalent to the perpendicular magnetic film.

However, the Kawato et al. reference relates to perpendicular magnetic recording, whereas the present invention relates to in-plane magnetic recording. Thus, the Kawato et al. reference is fundamentally different from the present invention. Accordingly, it cannot be considered that the Co-based amorphous ferromagnetic layer 105 of the Kawato et al. reference is equivalent to the in-plane magnetic film of the present invention. Additionally, the Co-based amorphous ferromagnetic layer 105 of Kawato et al., having a thickness of 20nm, is thinner than the perpendicular magnetic layer 107 (CoCrPtB), which has a thickness of 30nm. Therefore, Applicants believe that the Kawato et al. reference does not disclose or suggest that a tBr of the perpendicular magnetic layer 107 does not exceed one-fifth of a tBr of the Co-based amorphous ferromagnetic layer 105. Similarly, Applicants believe that the Kawato et al. reference does not disclose or suggest that an anisotropic magnetic field Hk of the perpendicular magnetic layer 107 is at least 1.2 times as large as an anisotropic magnetic field Hk of the Co-based amorphous ferromagnetic layer 105. Moreover, since the Kawato et al. reference does not disclose or suggest a recording layer formed of an in-plane magnetic film that is formed on a substrate and has a perpendicular magnetic film directly deposited on the in-plane magnetic film, as now recited in amended claims 1 and 7, withdrawal of the rejection of claims 1 and 3-7 is respectfully requested.

Claim 8 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Kawato et al., and further in view of Shimizu et al. (U.S. Patent App. No. 2002/0127433 A1. In response, Applicants have amended claim 8 to further recite a substrate and that a recording layer is formed of an in-plane magnetic film, and that the non-magnetic spacer layer has a first surface facing the substrate and a second surface facing away from the first surface such that the nonmagnetic spacer layer makes direct contact with the recording layer at the first surface, and makes direct contact with the perpendicular magnetic film at the second surface. Accordingly, Applicants respectfully traverse this rejection.

The Kawato reference teaches an opposite stacking order relative to the present invention. Kawato fails to teach a nonmagnetic separation layer between the in-plane magnetic film and the perpendicular magnetic film, as recited in amended claim 8.

The Shimizu reference teaches the use of a separation layer. However, the separation layer is provided between two in-plane magnetic films, and not between an in-plane magnetic film and a perpendicular magnetic film. Accordingly, even if Shimizu is combined with Kawato et al., the combination fails to achieve the structure recited in amended claim 8. For these reasons, withdrawal of the rejection of amended claim 8 is respectfully requested.

For all of the foregoing reasons, Applicants submit that this Application is in condition for allowance, which is respectfully requested. The Examiner is invited to contact the undersigned attorney if an interview would expedite prosecution.

Respectfully submitted,

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